

## Unit Cohesion and PTSD Symptom Severity in Air Force Medical Personnel

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**ABSTRACT** Research suggests that military unit cohesion may protect against the development of post-traumatic stress disorder (PTSD). However, equivocal findings have led researchers to hypothesize a potential curvilinear interaction between unit cohesion and warzone stress. This hypothesis states that the protective effects of cohesion increase as warzone stress exposure intensifies from low to moderate levels, but at high levels of warzone stress exposure, cohesion loses its protective effects and is potentially detrimental. To test this theory, we conducted a test for curvilinear moderation using a sample of 705 Air Force medical personnel deployed as part of Operation Iraqi Freedom. Results did not support the curvilinear interaction hypothesis, although evidence of cohesion's protective effects was found, suggesting that unit cohesion protects against PTSD regardless of level of stress exposure.

### INTRODUCTION

In the military, unit cohesion and support is fundamental to mission success and morale.<sup>1</sup> High levels of unit cohesion are associated with greater well-being, greater job satisfaction, superior unit performance, and lower incidence of disciplinary problems.<sup>2</sup> Given the importance of social supports in adaptation to trauma,<sup>3</sup> unit cohesion is likely to serve as a protective factor that moderates the relationship between warzone stress exposure and the development of post-traumatic stress disorder (PTSD). To date, few studies have directly investigated this question. Among those that have, equivocal results have been reported.

Using data from a sample of female healthcare providers studied as part of the National Vietnam Veterans Readjustment Survey (NVVRS), McTeague et al.<sup>4</sup> found an inverse relationship between unit cohesion and PTSD symptom severity (greater cohesion related to fewer PTSD symptoms). However, among male combat veterans who participated in the NVVRS, Fontana et al.<sup>5</sup> found that unit cohesion had no direct relationship with PTSD symptomatology.

In an effort to account for these discrepant findings, Brailey et al.<sup>6</sup> hypothesized a curvilinear interaction between unit cohesion and warzone stress exposure. The curvilinear interaction hypothesis states that unit cohesion protects against the development of PTSD and that this protective effect increases as stress exposure mounts from a low to moderate

level. However, at high levels of stress exposure, it is posited that cohesion not only loses its protective effect, but becomes detrimental (i.e., promotes the development of PTSD). This may explain why McTeague et al.<sup>4</sup> found that cohesion and PTSD were inversely related whereas Fontana et al.<sup>5</sup> found no relationship. That is, the combat veterans in the Fontana study were likely exposed to higher levels of stress exposure than the female healthcare providers examined by McTeague.

The notion that unit cohesion becomes a liability at high levels of stress exposure is consistent with the results of a secondary analysis by Fontana et al.<sup>5</sup> using the same sample of male combat veterans from the NVVRS. When the effects of unit cohesion were examined at different levels of stress exposure, results showed that although high cohesion predicted less PTSD among those reporting low warzone stress, higher levels of cohesion predicted more psychopathology among those reporting high levels of stress.

Why good unit cohesion might increase the risk for PTSD in high stress conditions is not clear. Brailey and colleagues<sup>6</sup> speculated that the protective effects of cohesion are largely attributable to an instilled sense of group efficacy (i.e., trust and confidence in the unit). During low to moderate levels of stress exposure, Brailey et al. argue that service members are able to meet the demands of the situation, thereby reinforcing their sense of group efficacy. However, at high levels of stress exposure, situational demands become insurmountable and problem-solving abilities are compromised. The sharp diminution of group efficacy may leave service members with a strong sense of disillusionment, increasing their risk for PTSD. Another explanation of how high unit cohesion may increase the risk for PTSD relates to the devastating effect of losing a close comrade (in highly exposed groups). Milgram and Hobfoll<sup>7</sup> argued that service members with highly cohesive units will experience a greater sense of loss and survivor guilt than those from low cohesion units.

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Brailey et al.<sup>6</sup> did not find evidence of a curvilinear interaction between unit cohesion and stress; however, the participants in this study were soldiers with no history of warzone deployment (stress exposure ratings were based on soldiers' previous life events). Thus, the authors suggest that the average rates of stress exposure were not high enough to detect a curvilinear interaction. Study samples with a large breadth and magnitude of warzone stress exposure are required to adequately test a curvilinear relationship.

To examine how unit cohesion and stress exposure relate to PTSD, we used data from Air Force medical personnel deployed to Iraq as part of Operation Iraqi Freedom (OIF). Medical personnel members serving within active warzones are known to face the dual burden of treating severely injured service members and being personally subjected to life threat.<sup>8,9</sup> Given the magnitude of warzone stress often endured by this population, we expected to find evidence of the curvilinear interaction hypothesis posited by Brailey et al.

## METHODS

### Procedure

Data for this study were collected as part of a larger, ongoing longitudinal study funded by the United States Air Force Surgeon General's Operational Medicine Research Program (FA7014-07-C-0036). Medical personnel serving as part of the 332nd Expeditionary Medical Group voluntarily completed surveys while deployed at Joint Base Balad, Iraq in the period between December 2004 and December 2008. Participants' mean number of days deployed at the time of assessment was 80.2. Informed consent was obtained from participants before deployment.

### Participants

A total of 705 U.S. Air Force medical personnel completed surveys while actively deployed as part of OIF. The sample included an almost equal number of men (48.4%) and women (51.6%), and participants were predominately white (69.1%), married (60.9%), between the ages of 25 and 29 years (19.3%), held a rank between E-4 and E-6 (41.3%), and had at least some college experience (92.7%).

### Missing Data

Of the 705 medical personnel who completed surveys, 171 (24.3%) were missing data on at least one variable of interest. To account for this, we employed a full information maximum likelihood (FIML) missing data algorithm when conducting regression analyses. FIML assumes that data are "missing at random" and is considered a state-of-the-art missing data technique.<sup>10,11</sup>

### Measures

#### PTSD Checklist Military Version

A modified version of the PTSD Checklist (PCL),<sup>12</sup> the PCL-Military Version (PCL-M)<sup>13</sup> was used to measure each of the

17 PTSD symptoms listed in the DSM-IV<sup>14</sup> using a 5-point Likert scale. The PCL-M has strong psychometric properties,<sup>15,16</sup> and showed good internal reliability in the present sample ( $\alpha = 0.93$ ).

#### Unit Cohesion Scale

Military unit cohesion was examined using a 5-item, rationally derived measure containing items similar to those used by Brailey et al.<sup>6</sup> Participants responded to items using a 5-point scale ranging from "not at all" to "extremely." Items were: "to what extent do you feel you belong in your present unit," "to what extent is your unit like a family to you," "do you respect the officers in your unit," "do you trust the airmen in your unit," and "how good are the available role models and leaders in your unit." The internal reliability for the current sample was adequate ( $\alpha = 0.82$ ).

#### Military Healthcare Stressor Scale

The Military Healthcare Stress Scale is a 21-item measure that was developed for this study to assess typical stressors associated with healthcare practice in the combat environment. Items were derived from focus groups containing military members who had previously deployed to Iraq and served on the Air Force Critical Care Aeromedical Team. Participants rated the degree to which they were emotionally impacted by exposure to patients with severe injuries using a 5-point scale ranging from "did not happen" to "extreme impact." Items included: "exposure to patients who were about to die," "exposure to patients who lost a leg," and "exposure to patients with severe burns." The measure demonstrated good internal reliability ( $\alpha = 0.96$ ).

#### Combat Experiences Scale (CES)

Exposure to events more commonly experienced by combat personnel (e.g., "being shot at," "shooting or directing fire at the enemy," and "being attacked or ambushed.") was assessed using a 21-item, rationally derived measure that includes many items drawn from the Peacekeeping Incidents and Experiences Scale.<sup>17</sup> The CES asks participants to rate the degree to which events emotionally impacted them using a 6-point response format ranging from "does not apply" to "extreme impact." The internal reliability for the current sample was good ( $\alpha = 0.89$ ).

### Data Analyses

To measure the level of stress exposure endured by the present sample, descriptive analyses were obtained for PTSD, healthcare-related stress exposure, and combat-related stress exposure. Potential demographic group differences in cohesion were then examined. *T*-tests were used to test for differences as a function of gender (male versus female) and race (whites versus nonwhites), and multiple regression was employed to test cohesion's relationship with age, education level, and military rank.

Hierarchical regression analyses were used to test the primary study hypothesis. Total PCL-M score was used as the

dependent variable. Our analyses were based on the recommendations of Aiken and West<sup>18</sup> and are consistent with the statistical methods used previously by trauma researchers examining curvilinear moderation.<sup>6,19</sup> In step 1, healthcare-related stress exposure, combat-related stress exposure, and unit cohesion were entered as independent variables. To test for linear interaction effects, product terms for both warzone exposure scales and cohesion (healthcare-related stress  $\times$  cohesion and combat-related stress  $\times$  cohesion) were then entered in step 2. In step 3, curvilinear moderation was examined by squaring each of the exposure scales and including these in the analysis both by themselves, as well as in product terms with unit cohesion (healthcare-related stress<sup>2</sup>  $\times$  cohesion and combat-related stress<sup>2</sup>  $\times$  cohesion). All independent variables were grand mean centered before being entered into the analyses and product terms.

Because members of the 332nd Expeditionary Force were deployed in cohorts, we used the "intercepts only" multilevel method described by Hox<sup>20</sup> to test for possible nesting effects on all study variables, with cohort entered as a level 2 variable. No significant nesting effects were observed.

## RESULTS

### Stress Severity

The mean PCL-M score reported by participants was 26.76 (SD = 11.06). On average, service members reported being moderately or severely emotionally impacted by 2.50 combat-related events (SD = 2.71) and 5.09 healthcare-related events (SD = 6.38). The items most frequently rated as having a moderate or severe impact were "seeing children or mothers who were victims of war" (46.9%; healthcare scale) and "seeing dead or seriously injured Americans" (51.4%; healthcare scale).

### Unit Cohesion

Unit cohesion had a significant inverse relationship with PTSD symptoms ( $r = -0.30, p < 0.01$ ). Unit cohesion did not differ by race ( $t = 0.29, d.f. = 692, p = 0.29$ ), military rank ( $B = -0.03, SE B = 0.24, p = 0.90$ ), age ( $B = 0.03, SE B = 0.11, p = 0.80$ ), or education level ( $B = -0.01, SE B = 0.20, p = 0.96$ ). However, unit cohesion did differ between gender ( $t = 3.03, d.f. = 492, p < 0.01$ ); greater unit cohesion was reported by men ( $M = 12.80; SD = 4.08$ ) than by women ( $M = 11.67; SD = 4.23$ ).

### Hierarchical Regression

As shown in Table I, each step of the regression analysis produced a significant model. In step 1, higher levels of both healthcare- and combat-related stress were associated with increased PTSD symptom severity. Unit cohesion was found to have a significant inverse relationship with PTSD. In step 2, the linear moderation effect was significant for healthcare-related stress, but not combat-related stress. In step 3, no evidence was found of curvilinear moderation (the quadratic

**TABLE I.** Summary of Hierarchical Regression Analysis for Unit Cohesion, Healthcare-Related Stress, and Combat-Related Stress Predicting Current PTSD Symptom Severity

| Variable  | $R^2$  | $\Delta R^2$ | $B$   | $SE B$ | $\beta$ |
|---|--------|--------------|-------|--------|---------|
| Step 1  | 0.33** | 0.33         |       |        |         |
| Healthcare-Related Stress                                       |        |              | 0.25  | 0.02   | 0.41**  |
| Combat-Related Stress   |        |              | 0.12  | 0.03   | 0.14**  |
| Unit Cohesion   |        |              | -0.66 | 0.09   | -0.25** |
| Step 2  | 0.36** | 0.03         |       |        |         |
| Healthcare-Related Stress                                       |        |              | 0.24  | 0.02   | 0.39**  |
| Combat-Related Stress   |        |              | 0.11  | 0.03   | 0.14**  |
| Unit Cohesion   |        |              | -0.61 | 0.09   | -0.23** |
| + Healthcare-Related Stress $\times$ Unit Cohesion              |        |              | -0.03 | 0.01   | -0.20** |
| + Combat-Related Stress $\times$ Unit Cohesion                  |        |              | 0.01  | 0.01   | 0.07    |
| Step 3  | 0.43** | 0.07         |       |        |         |
| Healthcare-Related Stress                                       |        |              | 0.22  | 0.02   | 0.36**  |
| Combat-Related Stress   |        |              | 0.10  | 0.03   | 0.12**  |
| Unit Cohesion   |        |              | -0.53 | 0.10   | -0.20** |
| Healthcare-Related Stress $\times$ Unit Cohesion                |        |              | -0.02 | 0.01   | -0.11*  |
| Combat-Related Stress $\times$ Unit Cohesion                    |        |              | 0.01  | 0.01   | 0.06    |
| + Healthcare-Related Stress <sup>2</sup>                        |        |              | 0.01  | 0.00   | 0.24**  |
| + Combat-Related Stress <sup>2</sup>                            |        |              | 0.00  | 0.00   | 0.10*   |
| + Healthcare-Related Stress <sup>2</sup> $\times$ Unit Cohesion |        |              | 0.00  | 0.00   | -0.07   |
| + Combat-Related Stress <sup>2</sup> $\times$ Unit Cohesion     |        |              | 0.00  | 0.00   | 0.06    |

$N = 705$ ; \* $p < 0.01$ ; \*\* $p < 0.001$ ; <sup>2</sup>, squared.

product terms were nonsignificant); however, the quadratic main effects (healthcare-related stress<sup>2</sup>, combat-related stress<sup>2</sup>) were significant (see Fig. 1).

### Cohort Effects

Covariance parameter estimates were nonsignificant across all variables. Intraclass correlations indicated that cohort assignment accounted for less than 1% of the variance in PCL-M, cohesion, healthcare-related stress, and combat-related stress scores. Taken together, these findings indicate that cohort assignment was not significantly associated with any of the variables of interest in this study.

## DISCUSSION

The purpose of this study was to examine how unit cohesion affects the relationship between warzone stress exposure and PTSD symptoms in military medical personnel. Specifically, we tested the curvilinear interaction hypothesis, which states that unit cohesion can promote the development of PTSD under high stress conditions. As expected, both healthcare-related stress exposure (i.e., treating severely injured victims of war) and combat-related stress exposure (i.e., experiencing personal life threat) were significantly related to PTSD symptom severity. Interestingly, both forms of stress exposure were found to relate to PTSD in a curvilinear fashion (Fig. 1). Service members exposed to a mild amount of warzone stress

endorsed fewer PTSD symptoms than those reporting no stress exposure. This suggests that some exposure to warzone stress may help to alleviate anticipatory anxiety among military medical personnel, possibly by providing individuals with an increased sense of self-efficacy. Alternatively, this finding can be seen as evidence for a stress inoculation effect,<sup>21</sup> in which adaptive forms of coping are reinforced through rehearsal and application.

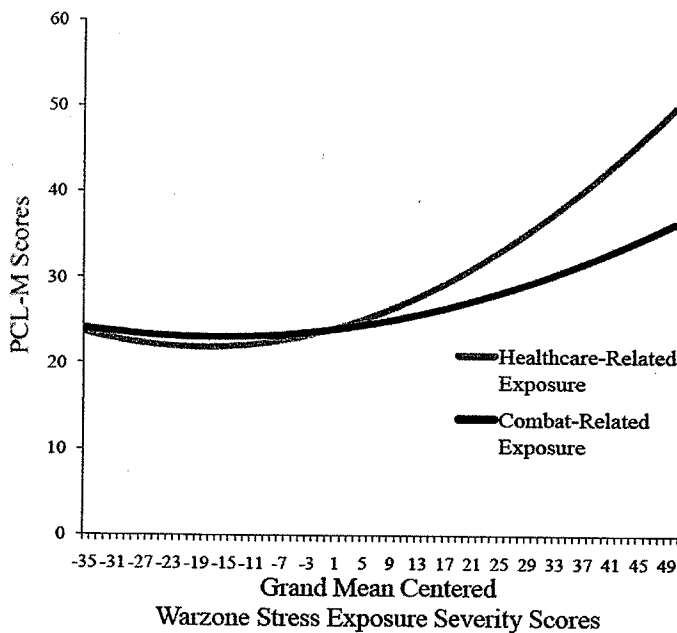
Contrary to our expectations, we found no evidence to support the curvilinear interaction hypothesis. We did, however, find a significant linear interaction between military unit cohesion and warzone stress exposure, such that greater cohesion was associated with lower levels of PTSD symptom severity (Fig. 2). This finding suggests that unit cohesion has a protective effect against the development of PTSD; it does not

increase the risk for PTSD, even at high levels of stress exposure. It is important to note that the magnitude of warzone stress endured by the average participant may have been insufficient for detecting a curvilinear effect. Similarly, the length of deployment at the time of assessment (80.2 days on average) may have precluded service members from experiencing a broad range of stressors. To date, the best evidence in support of the curvilinear interaction hypothesis comes from a sample of Vietnam combat veterans,<sup>5</sup> which suggests that the situational demands and mission stressors associated with ground combat may be most likely to interact with cohesion in a curvilinear fashion.

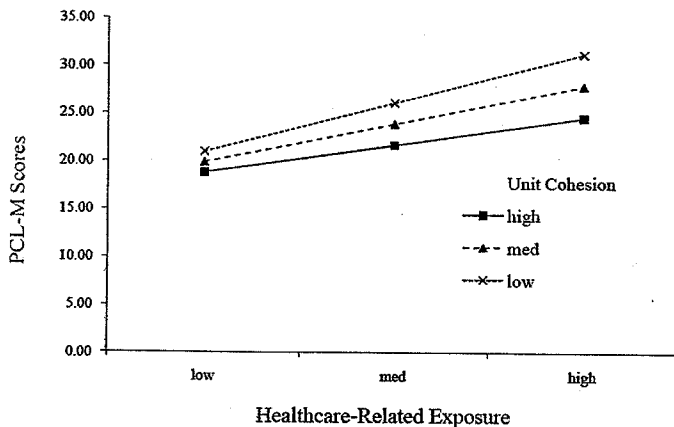
To help identify potential predictors of unit cohesion, we examined differences in cohesion across a variety of demographic variables. Little is known about which factors might predict unit cohesion, and identifying these factors may ultimately inform efforts to enhance cohesion among service members. Consistent with the results of a study of Army soldiers,<sup>22</sup> unit cohesion did not differ across racial groups. Furthermore, there were no group differences in cohesion as a function of age, education level, or military rank. We did find that men endorsed greater cohesion than women, although this difference was small. Taken together, these findings suggest that unit cohesion does not meaningfully relate to demographic group status. Future research aiming to identify predictors of cohesion may want to focus on other, non-demographic factors, such as unit members' previous life events.<sup>23</sup>

There are several limitations to our study that should be noted. First, data were cross-sectional and obtained while participants were actively deployed. Although this leaves the data less prone to retrospective report bias,<sup>24</sup> it also precludes the examination of long-term outcomes associated with cohesion. Second, we relied on self-report using rationally derived assessment scales. As pointed out by Siebold,<sup>25</sup> this not only raises psychometric concerns, but prevents researchers from agreeing upon a precise definition of the construct and a standard for how to assess it. Third, some researchers have argued that subsequent to the loss of a close comrade, high cohesion may exacerbate one's feelings of loss and survivor guilt.<sup>7</sup> Casualty rates within the 332nd Expeditionary Medical Group were not assessed in the present study. Accordingly, we were unable to test this theory. Finally, although most medical personnel members reported experiencing multiple stressful events having a strong emotional impact, it is possible that the magnitude and breadth of warzone stressors endured by this population does not sufficiently test the limits of the hypothesized curvilinear model.

Our findings provide further evidence that unit cohesion serves as a protective buffer against PTSD symptom development, regardless of level of stress exposure. Future research examining cohesion should sample military populations that have experienced high levels of stress exposure, including combat-related loss (i.e., ground combat troops). Research using prospective, longitudinal designs is needed to



**FIGURE 1.** Curvilinear relationship between combat- and healthcare-related stress exposure and PTSD symptom severity.



**FIGURE 2.** Linear interaction between unit cohesion and healthcare-related stress in predicting PTSD symptom severity.

draw causal conclusions about the relationship between unit cohesion and PTSD, as well as to identify possible variables mediating this effect. Given that cohesion is a modifiable construct, these data would inform efforts aimed at promoting cohesion among military units.

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